Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 994

Contribution from the Office of Farm Management and Farm Economics
H. C. TAYLOR, Chief

Washington, D. C. ▼ November 15, 1921

METHODS OF CONDUCTING COST OF PRODUCTION AND FARM ORGANIZATION STUDIES

By

F. W. PECK

Farm Economist

CONTENTS

	Page
Introduction	1
The Uses of Cost Studies	2
Basic Elements of Cost	7
Presentation of Results	8
The Several Methods of Study	14
The Accounting Method	15
The Survey Method	39
Combinations of Survey and Accounting Methods	46

WASHINGTON
GOVERNMENT PRINTING OFFICE
1921

UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 994

Contribution from the Office of Farm Management and Farm Economics
H. C. TAYLOR, Chief

Washington, D. C. ▼ November 15, 1921

METHODS OF CONDUCTING COST OF PRODUCTION AND FARM ORGANIZATION STUDIES.

By F. W. Peck, *Farm Economist.*[1]

CONTENTS.

	Page.		Page.
Introduction	1	The accounting method	15
The uses of cost studies	2	The survey method	39
Basic elements of cost	7	Combinations of survey and accounting methods	46
Presentation of results	8		
The several methods of study	14		

INTRODUCTION.

In 1902 the Minnesota Experiment Station began studies of the cost of production and of farm organization, which have been continued up to the present time. The Office of Farm Management, United States Department of Agriculture, began cost studies in 1906, and was closely followed by various State organizations.

The economic changes caused by the World War accentuated the growing demand for facts concerning the business side of the farmers' production of food. During the war it was necessary to husband the supply of certain food products; and to provide the food for large numbers in foreign countries it became imperative to obtain as large a production as possible of the staple food products. At the same time prices were fixed for various commodities for the purpose of stabilizing the market and acceleratiug the production and movement of war supplies. From the experiences with the setting of food prices it became apparent that there was a lack of comprehensive, conclusive data relating to the factors necessary to the understanding of the financial side of the farmer's business.

The rising prices brought about by the war created many local disturbances of prices of farm products, a ready example of which is found in the controversy over the cost and price of milk in many

[1] Since July 1, 1921, Director of Agricultural Extension, University of Minnesota.

consuming centers. Here, again, it was apparent that there was little accurate information by which to judge prices and on which to base findings as to cost of production. The result has been an insistent demand from producers and farmers' organizations for the cost of production data necessary to a full understanding of the farmers' problem of production.

The same urgent demand for cost figures has arisen in foreign countries, especially in England and Scotland. The authorities in these countries have appointed cost findings committees to develop accounting methods on the farm in order to obtain representative cost figures that will aid in a more complete understanding of the farm business.

The complicated details involved in the farmer's method of production and distribution make it inevitable that any hasty attempt to collect cost data will result in superficial, misleading, and usually inadequate information. This was apparent in many instances during the war. Out of the hodgepodge of estimates of costs and profits, often made for a specific purpose by various agencies, there has sprung a general misunderstanding as to the function and purpose of cost data and also considerable skepticism as to methods and results. There is no thorough understanding of the value and uses of cost of production data, and little material concerning methods of attacking the problem from its economic side is available.

The purpose of this bulletin is to throw some light on the fundamental concepts of cost data and to describe methods of study and the uses to which the data may be put.

THE USES OF COST STUDIES.

Absolutely accurate or universally applicable cost of production figures do not exist. This is apparent with farm products because of the many joint costs involved in the production of most of the staple products, and the necessarily more or less arbitrary allocation of some of the cost factors. The extreme variation from farm to farm in the cost of producing the same product, and the variations from field to field and in different animal units on the same farm become at once apparent in the tabulation of farm cost data. However, the value of the results of careful studies of cost is not impaired by this fact; for what the farmer needs in the reorganization of the farm business is figures which show the comparative profitableness of competing enterprises. For such purposes the figures obtained by the methods now used in farm cost of production studies are probably as satisfactory as are the results obtained in commercial accounting for similar purposes.

Sample Sheet

DAILY LABOR REPORT

Day *Friday* Date *4/20* 1920, Farm of *G.B. Smith*

REGULAR WORKERS

Name of Workman	Kind of Work	Field or Crop	No of Hours	No of Horses	No of Horse Hours
John	Plowing	A	4½	4	18
"	Disking	B	5	3	15
	Chores		1		
Fred	Market Hogs (6 Sows)		4	2	8
"	Harrow	B	5	4	20
	Chores		1		
Self	Market Milk		2	Auto	2 A
"	Repair Fence		3		
"	Shell Corn		3		
"	Plow Garden		2*	2	4
	Chores.		2		
No. of Paid or Men Exchange	EXTRA DAY LABOR				

Remarks: *Weather fair & warm*
Ground in good condition

FIG. 1.—Daily labor report blank.

DETERMINING RELATIVE PROFITS.

The individual farmer in any line of production is primarily interested in his total farm profit. Naturally his desire is to increase the total profit by eliminating the losing enterprises or the relatively low-paying ones, and to increase the returns from the better-paying lines of production. This means that his interest lies largely in comparing the profitableness of his separate enterprises, which

usually allow more or less latitude for selection and for varying the intensity of production and the general farm practices. Hence, one of the prime uses of cost studies to the individual is to determine the relative profits realized from the different parts of his business, with a view to pointing the way to changes in management and organization which will increase the total profit.

Year in and year out, losses and low profits may be more often caused by low yields in crops and low efficiency of production in live stock than by the wrong choice of enterprises, yet right choice of enterprises is the starting point in good farm management.

Not all the enterprises on the farm need be equally profitable to justify keeping them in the system of farming. Profits are influenced by the way enterprises fit together in utilizing labor, equipment, land, and products. A given enterprise must prove more profitable than any other enterprise which will fit into the same place in the program of the farm if it is to be introduced or retained.

The oat crop is notoriously low paying from a market standpoint on many farms in the corn belt, yet because in many places it pays better than wheat or barley, serves as a nurse crop, supplements corn from the standpoint of the labor program, and serves as a horse feed and a supplement in dairy and other stock rations, it increases the total farm profit. Beef cattle feeding has often been shown by standard accounting to appear unprofitable, yet because it provides a ready market for coarse feeds and by-products, a return for labor that would otherwise be wasted, and additional fertility for the field crops, it may add to the total profits.

Cost of production figures are valuable in making clear the comparative profitableness of the different enterprises and the different methods of production and thus give basis for intelligent decisions on what to produce and how to produce it in order to secure maximum net profits.

DETERMINING ECONOMY OF VARIOUS OPERATIONS.

An important function of cost data lies in their application to the ever-present farm problem of determining the relative economy of various methods of performing farm operations. The costs of producing field crops, for example, are usually reduced by increasing efficiency in the use of labor and equipment. One of the advantages of a good rotation of crops lies in the resultant weed control which often eliminates tillage operations that would otherwise be necessary.

The problem of intensity of culture is a question of relative costs per pound or per bushel as affected by the different combinations of the elements of costs in production. The choice of various methods of doing farm work depends almost solely upon relative costs as they bear upon the profits of the entire farm business. The knowledge required to make these decisions must be gained largely through cost studies.

Form A.

Regular Worker's Daily Time Sheet.

U. S. Department of Agriculture in cooperation with C. A. Smith, Oakdale, Mich

Day of Week: Tuesday Date April 30, 1912

	KIND OF WORK. Include implements used, number of loads, etc.	FIELD.	MAN HOURS.	HORSE NO.	HORSE HOURS.
4.30					
5.00	Care of Horses		1/2		
5.30					
6.00	Feeding Cows and Milking		1 1/4		
6.30					
7.00	Breakfast		—		
7.30					
8.00	Plowing for Corn, 7" deep	A	3	3	9
8.30	16" Riding Plow				
9.00					
9.30					
10.00					
10.30					
11.00	Disking for Corn (John Deere 12 Disk)	B	1 3/4	4	7
11.30					
12.00					
12.30	Dinner		—		
1.00					
1.30	Hauling Manure Spreader,				
2.00	3 Loads. Working with Ed Moore	A	2		
2.30					
3.00					
3.30	Rain - Nothing Done		—		
4.00					
4.30	Repairing Fence		1		
5.00					
5.30	Feeding Cows and Milking				
6.00	Care of Horses		1/2		
6.30					
7.00					
7.30	Supper				
8.00					

WORKMAN Sam Edwards TOTAL HOURS 10 3/4

REMARKS

REPORT O. K.
C. A. S.
Sup

8—84

FIG. 2.—Daily time sheet.

EDUCATIONAL USES.

From the standpoint of society, there is need for a study of farm costs to make available to the consuming public the facts that will place the producer and the consumer on a better basis of mutual understanding. That the consumers do not understand the various elements of cost and their relative importance is apparent. Publicity methods have rather confused the real issues in this regard

and there is need for plain statements of facts. Reliable cost data, properly presented, should go far toward doing away with much of the misunderstanding now existing.

Cost data have an important educational value to those starting a farm business. Just as engineering data obtained from records of experience in engineering pursuits are of value to subsequent engineering projects, so farm cost data, particularly as expressed in basic terms, are of value to farmers in planning the organization of their farms so as to obtain the largest profits. As experience accumulates in studying costs and prices, and as knowledge of the forces that affect these factors of the farm business increases, there should be a gradual increase in efficiency among the more backward farmers

USE OF COST OF PRODUCTION DATA IN FIXING PRICES.

Price fixing became popular during the war, largely because of the idea that it would solve a pressing economic problem. In view of developments, however, it has become apparent that the economic problem in question was not solved by the setting of prices.

There may be times when the setting of prices becomes necessary to stabilize the market and to insure a fair price, particularly when competition ceases and a monopoly charge prevails at some point in the middleman prices. However, the setting of food prices was not based on this hypothesis; indeed one of the principal purposes was to stimulate a larger production by making an attractive price. In many cases, however, it appears that the competitive price would have been more profitable to the producer and therefore would have stimulated at least an equal if not a larger production.

The problem of price fixing during the war was more difficult because of the unsatisfactory character of the data available, and the prevalence of the notion that cost of production was the only thing that should be considered. There is an important relation between cost of production and price, but it is clear that other factors than cost enter into the problem. The prices of most staple farm products are made by competitive forces in which market demands, fluctuating supply (which itself is affected by cost of production), transportation, custom, substitution, and other factors have important bearings.

There is a certain interrelation between cost and price that should be kept in mind if price fixing is considered on the basis of cost. An example will illustrate. With wheat at $2.50 per bushel, land valued at $200 per acre, with a normal yield, will pay 5 or 6 per cent, net. But 6 per cent of the land value has already been charged as a rental value of land in determining the cost to the farm concerned. Lower valued land of equal fertility and equally good location will produce wheat at a lower farm cost and leave a higher

net return; hence this land will rise in price under competitive conditions. Not only is this true but the price of the product is usually a basis for calculating the cost of seed in the process of growing the wheat crop. As the price of the product goes up or down over a period of time land values and labor costs tend to fluctuate accordingly. Thus if the market price of land is determined in part by the price of its products and in part by speculation, and the cost basis is used in determining prices, there becomes operative a pyramiding process that first increases the cost and then the price, with a consequent still higher cost, and still higher corresponding price.

The variation in farm costs in any product is so wide and the farmer's reaction to losses or low margins of profit so slow that the theory of farmers changing their type of production because of lowered margins of profits is often not substantiated in practice. Many farmers are satisfied with a lower rate of interest than is used in computing the cost. Anticipated increases in land values and the use of the farm as a home are compensating factors that enter into the concrete situation.

One of the outstanding differences between the methods used in the setting of prices on industrial products and that used in the setting of the price on the farmer's products has been that averages have been used in the case of farm products, while in the case of other commodities individual arrays of costs have been used to arrive at a bulk line or representative cost figure to include most of the production.

An expression of farm costs much needed is the array of individual costs per unit of production so as to show causes contributing to variations, and the proportion of the total number of units produced at the various levels of cost.

The average has not only been misunderstood but has been abused, in that it has been expected to serve a function for which it is not adapted, and hence gives a result which is often misleading and of less value than the frequency groups and ranges of individual costs. The use of the average in the consideration of the relation of farm cost to price has been particularly misleading because, in most instances, a very small percentage of the total production of a given product has been used as a basis of estimating the average cost, and the data secured were interpreted with little knowledge of how the use of the average figure would affect the large number of producers whose costs were above the average.

BASIC ELEMENTS OF COST.

Complete farm cost data necessarily deal with quantity requirements of crops and live stock, such as hours of labor and quantities of feeds and materials that are used in production. Such expressions

of costs are of more value than money costs because of their more stable character, and the various uses to which they may be put. It is essential, for example, to know rather definitely the measure of a day's work with various implements and various-sized power units under various farm conditions. It is important to the farmer to know how much labor is required, just when this labor is likely to find it hard to keep up with the business, and when work must be provided to give profitable employment during slack periods. It is important to know approximate feed requirements of various classes of live stock. With such information, the farmer can sometimes buy feed and supplies in advance in sufficient quantities to effect a considerable saving in operating expense.

Such measures of cost are here called "basic elements" because of their relative stability, as compared to money costs. Well-established quantity factors make it possible to estimate costs at any time by applying current prices to the requirements in hours of labor and bushels of seed.

The proportions of certain major costs to the total cost may often be considered basic in that the relative proportions do not change greatly under ordinary conditions, and calculations, the results of which closely approximate accurate costs, are readily made by using the proportions that are worked out by long-time cost studies.

PRESENTATION OF RESULTS.

Unfortunately, a considerable amount of the available information relating to the cost of producing farm products is solely in the form of dollars and cents, with the basic data as to labor and materials lacking. Furthermore, the time that elapses between the closing of the study and the publication of the data is often so long that a part of the value is dissipated because of the rapidly changing conditions.

Cost data should be so itemized as to allow detailed analysis and regrouping of items as desired. As an example, interest on capital should be shown as separate from operating expense, so that various computations of net earnings, gross profits, and other items may readily be made.

The principal factors to be kept in mind in the presentation of the results of cost data, particularly from a farm organization standpoint, may be mentioned in the following order:

1. Description of the physical conditions and contributory influences that affect practices and economic results of cost studies in a locality.
2. Data in basic quantity form (days of labor, bushels of seed, pounds of fertilizer) providing economic measures of capacity and production more or less widely applicable.
3. An array of individual variations in costs, profits, yields, and practices, to illustrate not only averages, but the extremes and the bulk line figures.
4. Arrangement of individual results into frequency groups with the interval selected to show the necessary dispersion and desired grouping.

PRESENTATION OF RESULTS FROM THE STANDPOINT OF OPPORTUNITY COST VERSUS OPERATING EXPENSE.[1]

Practically all publications of Federal and State departments of agriculture on the cost of producing farm products have very properly presented the figures on the basis of opportunity or alternative cost. This basis assumes some or all of certain premises as a background of consideration of the cost figures. Briefly, these premises usually are:

1. That the present-day capital value of the farm plant could readily be liquidated and the money invested with an assured interest return, thereby entailing the use of capital for which a charge should be made. This assumption is reflected in the charges for the use of the land against crop enterprises, in the building and equipment charges against the various enterprises, in the horse labor rate, in the man labor rate, and in the charges made against capital invested in live-stock enterprises. This entails including interest in all these phases as a cost and not as a part of the income to be distributed as a part of the profits.
2. That all labor is entitled to a certain credit per hour regardless of whether paid for in cash, in kind, or furnished gratis to the farm.
3. That, in some instances, account shall be taken of consumption by growing crops of fertility other than that placed upon the land by the farmer as manure or commercial fertilizer.
4. That a charge should be made for insuring the complete farm business on the assumption that if the farmer does not carry commercial insurance the farm business must sooner or later stand losses according to the risk.

As contrasted with the results obtained from this basis, which are called the "opportunity cost," it has been shown that individual farmers are constantly confronted with the actual bills of operating expense in the operation of their farms. It is pointed out that there is often no actual interest on the expense side of the farmer's ledger; a very small amount of labor is paid for in cash; there is no apparent decrease in yield due to consumption of fertility beyond that cared for by applications of manure and fertilizer; and on many farms little, if any, live-stock or crop insurance is carried.

Those who advocate including only actual expense as a cost basis emphasize the fact that on the opportunity cost basis many enterprises show a decided loss on the books, with perhaps a minus labor income for the farm as a whole, and the farmer is told that he has received no pay for his labor through the year and that the quality of his enterprises is such as to make them undesirable in a profitable

[1] *Opportunity cost* is here used in the sense of alternative uses being assumed for capital, feed, and labor. On this basis a land-rent charge is included in the cost of producing crops; seed is charged to the crop at its market price less cost of hauling to the farm; farm-grown feed is charged to live stock at the local market price less cost of hauling to the farm; and interest is charged on the capital invested in all forms of capital except circulating or working capital.

Operating expense is here used to express the cost estimated by excluding all interest charges on capital invested in land and buildings. Farm-grown feed is charged to live stock at the cost of growing the feed on the farm, but all labor concerned in the enterprise, whether paid for in cash by the farmer or not, is included in the expense. Seed is charged to the crop at the cost of production with the result that the only item not paid for directly by the farmer is that of the operator's and the family labor that may be included in the enterprise.

farm scheme. Nevertheless, this same farmer may have put money in the bank from the year's business, improved his home, perhaps expended money in the education of his family, and altogether may feel that he has not done so badly after all. One of the criticisms of cost of production studies for the past 10 years has been that theoretically most farmers have been put out of business, while actually they have continued to prosper and to improve their homes and increase their savings in the banks.

Form 57.-FM

U. S. Department of Agriculture
Office of the Secretary,
Farm Management.

Farm of Otto Leetch
Post Office Albania, N.Y.

REPORT OF REGULAR DAILY WORK AND NUMBER OF HEAD OF LIVE STOCK FOR THE MONTH OF July 1919

1. Fill out this blank on the last day of the month or as soon as possible thereafter.
2. Put down the number of head of each group and age of animals that you owned on the last day of the month, as given in the following list.
3. Estimate the average daily time of man and horse labor spent on the different kinds of regular work during the month past.
4. Inthe various columns under the heading "Changes in Number of Live Stock Owned" enter the number of head of each group sold, bought, born, died, or killed during the month, giving approximate dates.

Kind and age of stock	Number of head on hand on the last of month.	Average time per day for each kind of regular work.		Changes in Number of Live Stock Owned During Past Month.					
				STOCK DISPOSED OF			STOCK ACQUIRED		
		Minutes man labor.	Minutes horse labor.	No.	Date	Here state whether sold died or	No.	Date	Here state whether bought or born.
HORSES: Work,	4	50							
Driving	1	5							
Other									
Colts,									
COWS: Milking	3	40							
Dry,									
CATTLE: 1-2 yrs	1			1	27th	freshened	1 1	10th 27th	bought freshened
0-1 yrs	1						1	27th	born
Bulls,									
Beef,									
SHEEP:									
HOGS: Breeders	7								
Pigs 0-6 mos	52	60					8	14th	farrowed
Other hogs	13								
POULTRY	50	10		2	10th	Killed			

FIG. 3.—Regular chore work and live-stock report.

Form 26-FM

U. S. Department of Agriculture,
Office of Farm Management.

Farm of John Smith

Post Office _____

REPORT OF FEEDING LIVE STOCK FOR THE MONTH OF October 19 20

1. Fill out this blank on the last day of the month or as soon as possible thereafter
2. Put down the number of head of each group and age of animals that you owned on the last day of the month.
3. Enter the various kinds of feeds used during the month at the head of each column under "Average Daily Feed."
4. Under these feed headings and opposite the name of the stock, fill in the average daily ration. Give the ration in terms of quantity per head per day except where animals (as beeves, hogs, sheep, and poultry) are fed in groups, when the ration may be stated in terms of total quantity of each feed per day for each group.

Kind and age of stock.	Number of head on hand on last of month	Average Daily Feed. (POUNDS PER HEAD)							
		Oats	Corn	Bran	Skim milk	Silage	Hay	Straw (Inc. bedding	Field pastured
HORSES: Work,	5	10	8				15		
Driving,	1	8					15-21		A-10days
Other.									
Colts,	2	3	2				10		A-10days
COWS Milking,	12	2	2	4		30	12-21da.		B-10days
Dry,	3			4#-10da.		20			B.
CATTLE 1-2 yrs.	5					20			B
0-1 yrs.	4				25# calf				B
Bulls,	1					25	10		B
Beef,									
SHEEP:	24								Stubble fields
HOGS: Breeders									
Pigs 0-6 mos.									
POULTRY	75	No extra feed							

FIG. 4.—Feed report blank.

It may readily be shown by figures for a 20-year period that many dairymen in almost any given dairy section, from an opportunity cost standpoint (occasionally stressing more or less violently the various assumptions), have lost money practically every year, and the conclusion may be drawn that dairying as a business is decidedly unprofitable. It would require but a brief survey of actual conditions in a locality, however, to make clear that the farmers had nevertheless prospered, that homes had been built and improved, fairly adequate standards of living maintained, money placed in the bank, and mortgages paid off, so that, altogether, one might say that dairying was a fairly prosperous business. From an efficiency standpoint, that is,

when improvement of farm organization is the object, the weakness of this latter point of view is apparent.

Recognizing that the farmer should know the opportunity cost results and attempt to obtain a satisfactory organization that will provide the greatest net profit, it may be of interest in this connection to show examples that make it clear why farmers continue to produce at prices apparently ruinous from an opportunity cost basis.

The difference between the opportunity cost and the actual operating expense in a live-stock enterprise is particularly striking. This is true because the assumption that feed consumed by live stock could be marketed at local farm prices is an important feature of computing the cost on this basis.

Form C.

STATEMENT OF RECEIPTS AND EXPENSES.

Sheet No. 10

In cooperation with Office of Farm Management, U. S. Department of Agriculture.

Farm of O. A. Lee

P. O. Oakhill, Ill.

DATE. 1920.	ITEMS—DESCRIPTION.	AMOUNTS OTHER THAN CASH.	CASH RECEIVED.	CASH PAID OUT.
July	On hand—Cash balance forward		545 35	
1	Sold 2 tons hay to J. Jones		50 00	
4	Bought 100 # binder twine			20 00
5	Bought 2 ton tran on account	42 00		
7	Recd milk check for June		135 61	
7	Bought coal for threshing, 2 tons			22 50
8	Bought binder, paid 40.00 cash			
	I gave note for balance	200 00		40 00
10	K. Egg paid for seed corn,			
	he bought May 20.		8 75	
11	Exchanged 12 doz eggs for groceries	5 42		
16	Paid hired man for June			60 00
18	Sold horse to R. Dell, took			
	90 day note	175 00		
20	Cash prizes won at the Fair		28 50	
24	Expense exhibiting at Fair			6 50
24	Paid for tran, bought July 5			42 00
24	Clothing for self			12 00
25	Sold 6 Hogs 1435 #		215 25	
25	Repairs on wagon			2 00
26	Paid insurance on crops			30 00
	NOTE.—The cash balance should be the same as the amount on hand and in bank. Always compare cash balance with cash on hand and carry balance forward when correct.	Cash totals	983 46	235 00
		Cash balance		748 46

Remarks:

8—122

Signed: O. A. Lee

FIG. 5.—Cash account sheet.

TABLE 1.—*Beef-cattle loss and gain (actual farm figures).*

Number of steers	48
Farm income	$8,398.00
Labor income	$2,996.00
Book loss (feed at farm price plus interest on cattle capital)	$1,103.63
Book loss per head	$23.00
Gain (feed at cost of production, no interest)	$659.62
Gain per head	$13.76

Table 1 illustrates the point from a beef-cattle enterprise. On the farm in question, which yielded a farm income of over $8,000 and labor income of approximately $3,000, the book record on 48 steers, with feed at market prices and interest included as a cost, showed a net loss of over $1,100, amounting to $23 per head. Viewed from this angle only, a man having this experience might be considered quite speculatively inclined if he were to continue to feed steers.

Charging the feed to the steers at the operating cost of production, however, with no interest on land charged as a cost, there is a gain for the cattle enterprise of $659, amounting to $13.76 per head. This approximates what the farmer actually received from feeding cattle. In other words, while he did not receive fully quoted farm prices for all the feeds consumed by the steers, he pocketed what might be termed a fairly satisfactory return for his handling of the cattle if there is no thought of what might have resulted if he had perchance done otherwise. It would not be surprising if this farmer were to continue his feeding operations.

Carrying the comparison of opportunity and operating cost into the feeding of hogs, Table 2 illustrates the returns from the feeding of hogs for three years on a Minnesota farm.

TABLE 2.—*Hog profits on a Minnesota farm.*

	1913		1914		1915	
	Cost per bushel.	Farm price per bushel.	Cost per bushel.	Farm price per bushel.	Cost per bushel.	Farm price per bushel.
Corn	$0.39	$0.48	$0.32	$0.53	Soft corn.	
Oats	.16	.40	.28	.32	$0.18	$0.42
Barley	.29	.56	.28	.54	.34	.45
Hog profit per head	10.62	5.52	10.24	.84	4.30	2.20

This table presents the comparison of the operating expense per bushel of corn, oats, and barley produced on the farm and the average farm price, which was used as the charge for the feed consumed by the hogs under cost-accounting procedure. It will be noted that the profit in 1913 in charging the feed at farm prices was fairly satisfactory from a cost standpoint, amounting to $5.52 per head. Charging the feed at actual operating expense to the farmer showed a profit

to the hogs of $10.62 per head. It was still more striking in 1914, when the book profit was only $0.84 per head under the opportunity cost, while on the other basis the profit was $10.24 per head. In 1915, owing to the condition of the corn crop, the amount of profit per head was not as great, but the difference in the two methods was about the same as in 1913.

A danger may lurk in the farmer being satisfied with a nominal profit and not attempting to increase the productivity of his enterprises for further profits. Any analysis should make clear that the live-stock profit on the actual expense basis includes in reality a profit on the crops grown for feeding purposes and that with each enterprise standing on its own feet from a relative cost and profit standpoint the result would not be the same. This point is more fully discussed under methods of charging feed to live stock.

Thus there is an obvious need for analysis, both of the opportunity cost and the actual operating expense in a farm business, of the one for the purpose of pointing out possibilities and fostering more profitable farm organization, of the other to show why production is continued and prosperity real, though not apparent from a business point of view. For certain purposes presumptive results have a working value, but actual results may well go along with the opportunity cost figures to maintain the balance of the analysis.

THE SEVERAL METHODS OF STUDY.

There are several distinct methods and combinations of methods which may be used in obtaining cost of production and farm organization data. The two outstanding methods may be termed (1) the accounting method and (2) the survey method. The following outline sets forth the various modifications and combinations of these methods that have been used more or less successfully. They will be discussed in the order they are listed below.

I. Accounting method.
  1. Route plan.
    a. Entire farm business.
    b. Enterprise and farm business study.
    c. Extensive enterprise study.
  2. Occasional visit and book plan.
  3. Correspondence plan.

II. Survey method.
  1. Farm business analysis.
    a. Single extensive survey.
    b. Continued surveys.
    c. Periodic repeated surveys.
  2. Enterprise cost studies.
    a. With farm business analysis.
    b. Without farm business analysis.
  3. Questionnaire.

III. Combinations of I and II.

FARM PRODUCE USED IN HOUSE

Farm of J. Henry Month Jan. Year 1919 Value

Cream	8	qts.	22	% test @		57¢
Whole Milk	45	"	4	% " @		57¢
Skim Milk	30	"		% " @		$1.00 cwt.
Butter	6	lbs		% " @		55¢
Eggs	15	doz.		@		45¢
Poultry	10	lbs. dressed		@		36¢
Potatoes	2½	bu.		@		$2.60
5		Regular boarders	155			Man Days
2		Extra boarders	10			Man Days
				Total	165	Man Days

Number women doing housework 1

FIG. 6.—Monthly household record.

THE ACCOUNTING METHOD.

Detailed farm cost records are the outstanding feature of cost of production studies by this accounting method. This tends to narrow the number of farm records that can be obtained with a given fund for research. As contrasted with the survey method, it entails the keeping of direct, individual accounts, whereas the survey statistics are gathered in a rougher fashion that enables the investigators to cover ground more rapidly.

The principal advantage of the accounting methods is its accuracy. It provides a body of fact that is valuable as a basis for fundamental cost and organization studies. Its disadvantage lies in the comparatively small number of farms that can be studied with a given fund, and in the danger that at least a part of the number selected will not be typical or representative of a sufficient number to make the data worth while. Another disadvantage, from an investigational standpoint, is the need of close supervision of the work, which not only is costly from a money standpoint, but requires efficient, experienced supervision that is relatively difficult to obtain.

Several plans have been developed for making use of the accounting method. The three most common are (1) the "route" plan, originated, and maintained with but few changes, by the Minnesota Experiment Station; (2) the occasional visit and book plan, as used by Cornell University in the State of New York; and (3) the correspondence plan, as inaugurated and maintained for a number of years by the Office of Farm Management, United States Department of Agriculture. The principles underlying the accounting practice

are similar in all plans and these will be touched upon before considering specific plans or methods.

PRINCIPLES OF FARM-ACCOUNTING PRACTICE.

The first step in starting the detailed accounting study on farms is to make a detailed inventory at the beginning of the farm year. It is essential that the farm year start before active field work on the season's crops begins, and it is a common practice to start either January 1, February 1, or March 1. Particular emphasis should be laid upon the accuracy of taking the opening inventory. Cost studies are usually organized on a five-year basis, and it is essential that a proper start be made, with a careful, accurate, detailed inventory of all the forms of capital that enter into the farm business. Because of its importance it is felt that it is worth while to mention a few of the principal items that often cause difficulty in making a satisfactory farm inventory.

REAL ESTATE.

The term "real estate," as it is commonly used in investigational work, includes the land, buildings, and land improvements such as drainage systems, water systems, fences, and other physical improvements.

The question at once arises as to the most serviceable basis of valuing the land. The productive capacity of the land is often advocated as the proper basis, but all farm business analyses indicate that considerably lower values result when the earnings are capitalized at going rates of interest than obtain when going sale values are used. For example, in parts of the corn belt the farm earnings net 2½ to 3 per cent to the owner-operators of land with a valuation of $250 per acre. With the values of land arrived at by capitalizing the earnings at 5 or 6 per cent the land values would be correspondingly reduced.

The weakness of capitalizing a cash land-rental charge to arrive at a value lies in that thus we capitalize only the current year's rent, leaving out of consideration the future earnings, which should be considered. Theoretically, this method might be used if land were more stable in production, with long-time records of performance available. It should be kept in mind that the values arrived at on a sale basis may involve unearned income which has been added to the price in anticipation of future advances in value. Thus, in arriving at the net farm earnings, interest on unearned capital is involved as a factor. Also, in showing the farm earnings in the form of a certain per cent of the capital value, or in the form of labor incomes, there is ample opportunity for misinterpretation of the results and for a wide variation in the results, depending upon the value placed on the land. The common practice is to carry the

value of the land in the closing farm inventory at the end of the year the same as at the beginning of the year if the object is to learn the net income from operation. If the land has increased in value, in the opinion of the operator, this increase should be kept separate from the current farm earnings.

The common basis of land valuation for farm organization and cost studies has been the conservative, going sale value of land. This appears at the present time to be the most practical basis, though numerous attempts have been made to apply various theories in arriving at land values.

The site value of the farm as a home has an important bearing on the selling price of a farm as well as on a valuation for loan or for investigational purposes. We can not ignore the fact that a farm is a home site as well as a business plant, and that a certain portion of its value may be due to location and the personal desire of the occupant to live in that particular spot. It would doubtless be advantageous to studies in farm economics to express the farm value both as site value and productive value, each of which would be useful, depending on the nature of the study and the use to be made of the resultant figures.

It is best to assign separate values to each of the buildings entirely distinct from the value of the land and its improvements. The separate values of the buildings are necessary to the proper allocation and distribution of the building charges. A common method of arriving at the value of the bare farm is to set what is considered a fair valuation for the farm as it stands, including the land, improvements, and buildings, and then deduct the value of the buildings, estimated separately.

For some purposes it is advisable to go further and to evaluate different parts of the farm at varying prices. For example, some crop land is more valuable than other crop land, and very often more valuable than permanent pasture, woods, and land too rough for tillage purposes.

In placing a value on a building, it is worth while to note its size and jot down a brief description, along with the valuation. There are two methods which may be used in arriving at the present value of farm buildings. One is the common accounting practice of basing the present value on the basis of the original cost and the number of years it is estimated that it will be in use on the farm. This is known as the "original cost basis." The other method is that of estimating the present replaceable value, depreciated on the basis of the number of years the building has been used and the number of years it is estimated it will last.

FARM PRODUCE

Farm of J. Smith Monih Jan. Year 1920

Date	Eggs Laid	Poultry Used	Milk Used	Butter Made	Butter Used	Pork		Potatoes	
1	24		20ts						
2	26								
3	32								
4	28								
5	24			5lbs.					
6	27	3lbs.							
7	22								
8	19					Killed			
9	21			6lbs.		Hog			
10	24	3lbs.				Wt			
11	18					180			
12	17					lbs.			
13	17			4lbs.				3 bu. for month	
14	19				3 lbs. per week				
15	16		Same each day						
16	15								
17	18	4lbs.		7lbs.					
18	19								
19	14								
20	15								
21	12			6lbs.					
22	15								
23	12	5lbs.							
24	13								
25	14			5lbs.					
26	10								
27	11								
28	10			5lbs.					
29	9	2lbs.							
30	10								
31	12								
Totals	543	17lbs.	62qts	38lbs	12lbs	180lbs		3bu.	

NOTE.—The weights of any farm animals, such as hogs, veal, etc., slaughtered during the month should be recorded in one of the blank columns above.

FIG. 7.—Daily household record.

The argument in favor of using the replacement value as a basis is that it places the values consumed in shelter and storage uses on the present-day price level. There may be considerable difference, for instance, between the shelter cost computed on the basis of original cost for a cow housed in barn that originally cost $1,000 fifteen years ago and the cost computed on the basis of the barn's replaceable value, since such a barn would probably cost $3,000, with materials at 1920 prices.

The permanency of the price level is one of the factors to be considered in changing from the original cost to the replacement-value method. If building materials are on a more or less permanent level of prices and the decline to a lower level may be expected to be gradual, then the practice of estimating present values on the new price level becomes a much safer basis then if the prices of building materials were likely to fall suddenly to their former price level.

The safer basis of valuing buildings and equipment over a term of years is that of the original cost, thereby eliminating the dangerous practice of estimating present-day values, in the face of shifting prices of building materials and farm machinery. It has been pointed out by some that if the original cost basis of valuing buildings and machinery is maintained the original cost basis should also be used in computing the interest on the actual investment in land and its improvement. There is considerable difference, however, between charging depreciation on buildings and interest on land. Buildings and equipment always depreciate, whereas land often becomes more and more valuable. Land is therefore likely to remain at its increased price, at least for a considerable length of time, but the value of buildings if raised must be depreciated again. For the purpose of comparing costs and relative profits the land value basis adopted by the leading authorities in the study of the farm business has been the conservative ready sale value, regardless of the original cost of the land and improvements.

EQUIPMENT.

The equipment on the farm should be itemized in detail and classified according to its use. It is always advisable, if possible, to learn the date of purchase and the original cost of each implement concerned in the farm operation. Two methods have been advocated in placing the present value on farm machinery; one based upon the first cost, depreciated by the number of years of use and its present condition, and the other that of estimating the present depreciated value by assuming the machinery cost at present prices when new, and depreciating it by the number of years and its present condition. Theoretically, the amount of work done should have a strong influence in the fixing of present values. Practically, this factor may be

relatively unimportant, as other factors, such as shelter, adjustment, care, and obsolescence, often affect depreciation far more than its actual use.

The high prices of farm machinery at the present time (1921) compared with those of the prewar period (1916) make a considerable difference in the results obtained by the two methods suggested above. Over a ten-year period, under normal conditions, there would not be a great deal of difference, but during the last year this has been a much discussed question.

The same advantages and disadvantages are apparent in valuing farm equipment as mentioned under farm buildings, namely, that the discrepancy between the two price levels, the original cost and the present cost of machinery, is so great as to be very noticeable in estimating the enterprise costs of machinery by the two methods. If prices should show a slow decline from their present level over a number of years, the use of replacement cost in estimating present values of machinery consumed would prove more satisfactory than if the price level should drop suddenly to its former level. Inasmuch as most of the machinery now on the farm will be replaced by new machinery at new prices within a five to eight year period, the original cost basis will soon be reestablished. Herein the equipment differs from farm buildings, as it will be a long time before the present farm buildings are replaced, as compared with the replacement of equipment.

LIVE STOCK.

In farm cost-accounting practice the farm live stock is divided into two general classes, productive and indirectly productive or nonproductive, according to whether the stock under consideration is directly income producing. Ordinarily the work horses are considered in the indirectly productive or nonproducing class, and as such are classed in the fixed capital assets of the farm.

The most common basis of valuation for all live stock, including work horses, is that of the ready sale value, regardless of the cost of production. This sale value is presumed to take into account the age, fitness for duty, weight, size, condition, and other factors relating to the values of live stock.

A characteristic difference between live stock and other equipment is that of appreciation of animals, not only while growing to work or producing age, but for a certain period after that time. A ready example is the increase in value of horses up to 6 years of age and of cows to 5 or 6 years of age, before they have reached what is ordinarily termed "their prime." Thus it is that many farmers plan on meeting the depreciation of producing herds and working units by the raising of young stock. In cost accounting practice, however, the

young stock is usually kept separate from the older stock, with depreciation playing a prominent part in the records of the older animals.

Where purebred stock is maintained the element of appreciation from a breeding standpoint is always present, but depreciation also becomes quite striking, particularly in view of risks of disease or injury incurred in the maintenance of purebred herds. An important source of loss arises when young animals prove to be indifferent breeders. Conformation qualities are detected early in life but breeding qualities only after maturity. At the same time a distinction is noticeable in estimating depreciation in purebred herds between the value of the animals as producers of salable products, such as milk, and their value as breeding animals.

In connection with the depreciation of live stock, the block value of breeding stock for consumption purposes should be kept in mind, as this enters into any percentage figure which is used to indicate the approximate depreciation from the previous inventory value.

In all inventories of live stock it will be seen that the fluctuations in market prices have an important influence on the values ascribed to each class of stock. This was particularly noticeable during the war period, when the market prices of certain classes of stock increased to a high level while others increased slowly, in the case of horses scarcely at all.

FEEDS AND CROPS HELD FOR SALE AND FOR FEED.

Where it is possible to separate crops held for sale from the feed that will be used for live stock, there is no question as to the basis of valuation for the products held for sale. The farm value, which is the market value less the cost of marketing, should be the basis for valuing all crops held for sale which appear in the inventory.

There is a difference of opinion as to the proper basis of valuing feeds to be fed to live stock. There are usually two classes of such feeds, namely, the salable feeds, such as oats, corn, and hay, and the nonsalable, such as silage, corn stover, and low-grade hay. The common basis used by most farm accounting authorities for salable product inventories is that of the farm price, which, as indicated above, is the market price less the cost of marketing. This feed is usually charged to stock at the going monthly farm price. The other basis, that of the cost of production, is advocated by some, particularly English authorities, who maintain that the cost of producing live stock for the market should be based upon charging the feed consumed at its actual cost and not at the price that might have been obtained for the feed if used in an alternative way.

In deciding which basis of valuation to use for the salable feeds, one of the fundamental uses of cost of production figures in the farm business must be taken into account. This important function is that of affording a comparison of the profits of the various farm enter-

prises and an indication of the preferable uses of the various forms of farm capital. For example, shall the crops grown on the farm be fed to dairy cattle, to beef cattle and hogs, largely to hogs alone, or sold for cash on the grain and hay markets? Does it aid in understanding the farm business to show the profits from growing crops as credits to the live stock that may be maintained? It is plain that if, for example, the intention is to show the profits in dairying, it can often readily be shown that very low-producing cows will show a profit if the basis for charging crops fed is the cost of production on a farm where the land is fertile and good yields are realized. But if a crop is looked upon as a separate enterprise, it is desirable to find out the status of the enterprise with the return considered as being available for use either in the form of cash from sale of the product or in the form of feed charged to live stock at what the feed would be worth were it purchased.

On the other hand, it is apparent that one might consider the returns from his farm as a double profit if he computed the profits from his crops, and at the same time the crops when fed to live stock were charged at cost and the crop profits again reflected in the live-stock accounts. As a matter of fact, most farmers are interested in the grand total profit and in eliminating as many of the low-producing enterprises as possible. Where a farmer does not go into the details of his costs in an analysis of his business, the easiest way of expressing his profits from farming is simply to show the difference between expenses and receipts in one lump sum. For example, if the principal salable products from the farm business are cattle and hogs, one may learn the profits from this business by deducting all expenses of running the farm from the total receipts, and in expressing the cost per unit of doing business it would be justifiable for the operator to divide the total expense by the total number of salable units. However, this process of accounting would not necessarily indicate that there might not be more profitable alternative uses for the crops that were fed to the cattle and hogs and for the other forms of capital consumed in their production.

Thus it will be seen that two entirely opposite conclusions may be reached by the two different methods of considering the cost per unit of product put on the market. Taking the example already cited (p. 13), where home-grown feeds largely constituted the feed consumed, the steers might cost, say, $60 per head, if the feed be valued at its cost of production. If the feed is valued at its farm value, which is the market value less the cost of marketing, the same live-stock units might show a cost of over $100 per head. If we assume that the live-stock units were sold at $100 per head, the first method would show a profit of $40 per head, while by the second method a loss would be indicated. As a matter of fact, the operator

knows that there is an appreciable return from his total farm operations, and to tell him that he suffered a loss on every live-stock unit he marketed is confusing to him. The confusion here lies in the analysis of the business. In one case it should be realized that the profits from growing the crops are returned in the form of live-stock products, and it might be equally true that were the field crops sold at their local market prices there might have been a still larger amount left in the bank after the expenses were paid. The farmer is primarily interested in comparing profits on the separate enterprises as well as knowing the total profit from the entire business.

For the nonsalable crops the common basis used by the Office of Farm Management and Farm Economics, and by most experiment stations, is that of the cost of production, as nearly as it can be estimated. In taking the opening inventory on a farm it is sometimes difficult to estimate the cost of production of such products as fodder, wild hay, roots, and other crops that have no ready sale value. Usually a very close estimate can be made, however, on the basis of the yield, the seed-bed preparation, the cost of harvesting, and other cost factors of the particular crop. With regard to corn silage, when the yield can be fairly accurately estimated in terms of bushels of marketable corn, it is quite satisfactory to estimate the value per acre of the corn crop at time of harvesting, minus the cost of husking, plus the cost of putting the corn in the silo. The cost of the latter operation is estimated on the basis of the approximate amount of time and the force necessary to fill the silo, and the engine and equipment charge in the operation.

Another basis that has been used in estimating roughage values is that of the comparative feeding value, taking from experimental data the comparison of the feeding value of wild hay, silage, corn stover, corn fodder, and similar feeds as compared with the feeding value of marketable hay grown by the farmer or of a commercial feed, such as bran.

The basis for valuing perennial or growing crops in the field at the time of inventory should be that of cost of production to the date of inventory, taking into consideration land preparation, value of seed, and any labor spent on the care of the crop chargeable to the current year's expenses. In the case of a crop like alfalfa, where no nurse crop has been used and where no crop has been obtained the previous year of seeding, it is necessary to include land rent and taxes for the previous year, but this charge should be distributed over the number of years which the crop will last with the original seeding.

ITEMS IN QUESTION IN COST ACCOUNTING.

Supervision.—In computing the cost of producing a farm product the point has been raised repeatedly as to the value of the operator's

labor that has gone into the enterprise. The point is made that the going rate of wages paid to hired men is not a fair figure to cover the management and supervision given by the farm proprietor. In instances where hired managers are employed the total cost of their employment is distributed as a labor cost over the various enterprises, so that this question usually arises only with reference to the work of a proprietor.

The position is taken by the Office of Farm Management and Farm Economics, and by most authorities, that the net returns from an enterprise or from the farm as a whole should pay for the supervision of the proprietor, and that the work he does should be counted as a charge at what such service could have been hired for. If a separate estimate of the value of the farmer's time is used as a supervisory charge, there is always a question as to the validity of the estimate made, and in some instances this estimate may distort the cost so that the results will be valueless for comparison.

Fertility.—Not only have questions been raised as to the method of charging crops with the manure applied to them, and at the same time crediting it to the live stock responsible for its production, but the point has been made that in estimating the costs of producing crops an allowance should be made for the value of the fertility consumed in production, regardless of whether any fertilizer is applied.

In instances where commercial fertilizer is used the practice has been to charge the first crop with all or a share of the actual cash cost, depending on the rate of availability of the fertilizer. In the case of farm manure the increase in returns due to the application of the manure is very difficult to estimate accurately, as the increase varies greatly with the kind of soil, the topography of the farm, the present yielding qualities of the land, the kind of manure, the time of year applied, the rate of application, the manner of handling in the barnyard, and other factors that complicate the problem.

It is apparent that an application of manure or fertilizer to a crop in one year provides a residue that is made available to succeeding crops through a term of years. In the case of barnyard manure it has been arbitrarily decided, where the farm is operated on a more or less definite rotation plan, to apportion the manure expense on the basis of either 50, 30, and 20 per cent over three years, or 40, 30, 20, and 10 per cent over four years, depending somewhat upon the nature of the soil. In the case of commercial fertilizer, the more quickly acting fertilizers, such as nitrate of soda, are often charged as an annual expense, but lime and rock phosphate are usually charged over a four or five year period. More definite results from experimental work will probably give a more definite basis for this charge in the future than exists at the present time.

Confidential Information,

COST OF PRODUCING 1919 WHEAT CROP.

Office of Farm Management U.S. Department of Agriculture, Washington, D. C.

1. Name J. Smith Address Kansas R.F.D.
2. Farm operated by owner or tenant Owner
3. No. of acres in farm 240 Value of land per acre with improvements $ 225
4. Acres of wheat seeded, 1919 65 Acres harvested, 1919 65
5. Total yield of wheat, 1919 1180 Yield per acre 18 Usual yield 22½.

6. TOTAL DIRECT LABOR ON ENTIRE WHEAT CROP, 1919.

Operation	No. Men	No. Horses	Total Days	Hours per day	Operation	No. Men	No. Horses	Total Days	Hours per day
A. Manuring	1	3	2	10	H. Seeding	1	4	5	12
B. Plowing	2	4	22	10	I. Cutting	1	4	7	12
C. Tractor Labor					J. Shocking	2		14	12
D. Disking	1	4	11	10	K. Stacking				
E. Harrowing	1	4	5	10	L.				
F. Cleaning and Treating Seed	2		1	12	M. Threshing	21	18	41½	12
G. Hauling Seed or Fertilizer	1	2	2	12	N. Marketing	1	2	5	12

7. No. of acres fallowed in 1918 for 1919 wheat crop 42
8. Estimate the total man hours 220 Also total horse hours 220 and total tractor hours None on this fallow land
9. Was this fallow labor included in Table 6? Yes
10. Quantity of seed used per acre 5½ pk. Total seed used 90 Price per bu. $2.10
11. Acres of wheat land fertilized —— Tons per acre Price per ton
12. Acres of wheat land manured 10 Loads per acre 5 Value per load None
13. Total lbs. of twine used on wheat 163 Lbs. per acre 2½ Price per lb. 23¢
14. Cash premiums paid for wheat insurance None Wheat insurance received
15. Total cash cost for threshing wheat $ 118. Rate per bushel 10
16. What items are included in threshing charge? Machine bill only
17. Rental paid per acre for wheat land Own land
18. Total value of material purchased for seed treatment $ 1.00 Value per lb.
19. Interest rate on farm mortgages in your section? 6%
20. Taxes for entire farm $87.50 How often do you have partial crop failure 4th yr. or complete crop failure once in 20 yrs
21. Yield of wheat straw per acre 2 tons Value per acre How utilized
22. Total value of wheat pasture None Value per acre
23. Rotation followed 2 yrs corn, 2 yrs wheat and 1 yr. clover
24. Value of man labor per hour 60¢ Value of horse labor per hour 30¢
25. Any other production costs?

FIG. 8.—Questionnaire used in wheat study.

As for the value of the fertility removed from the soil, irrespective of fertility applied, the common practice has been to make no charge if no fertilizer has been applied. It is obvious that if such a charge is made, certain crops, particularly the leguminous crops, should have credit for providing nitrogen and other fertilizer constituents to the soil. The argument is advanced that land can not indefinitely produce crops without having fertility returned to it in some form, and that to figure costs without taking this into consideration is simply to charge the land with a deferred payment which must be made later on. In practice, however, difficulty arises in reducing

the charge for plant food consumed to a definite and practical basis. Soils are so variable in physical condition and soil theories are still so unsettled as to make it extremely difficult to set a standard which will be generally acceptable. Assuming that a charge for consumed fertility might be made against the crop, it is obvious that the account to receive the credit would be the land. This would mean making land values variable, according to the kind of crops grown. It can readily be seen that this would lead to great confusion.

The fertilizer cost item illustrates the extreme variability that exists in the cost of farm products because of the great variation in soil types, farm practices, and fertility methods. Without more definite data than are now available it becomes dangerous to make arbitrary charges for the fertility removed from the soil.

Interest.—Considerable difference of opinion exists as to the practice of including interest as a cost in farm-cost accounting. Commercial accountants are divided into two schools on this question and two procedures are followed in commercial accounting. Many authorities include interest for certain organization studies and omit it as a cost in arriving at conclusions on other lines. Cole [1] states that proper accounting is based primarily on the purpose served, and relates only secondarily to the object with which the expense chances to be identified. The principal purpose of farm cost accounting, from the standpoint of the farmer, is to provide figures that will make it possible to compare the costs and profits of competing enterprises on individual farms. Hence the inclusion of interest as a cost in farm accounting as a matter of fact is not contrary to the principles of commercial accounting if more profitable farming is the object.

The use of capital, whether in the form of land, live stock, or equipment, whether borrowed or provided from a surplus, is an element of cost in production that must be reckoned with and allowed for in any adequate accounting system. Statements of business men, economists, and at least a representative number of accountants confirm this practice in comparative analyses of various units of industry.

Hatfield [2] clearly points out that where it is essential to determine whether capital shall go into a given industry or not, what is wanted is a correct estimate of the net income after deducting all interest on capital and other items frequently excluded from cost accounts themselves. "The information necessary to show whether an enterprise is ultimately successful is very different from that which shows whether an enterprise once established should be continued." The comparison of farm enterprises in this connection clearly necessi-

[1] Accounts—Their Construction and Interpretation, by William Morse Cole, p. 114.
[2] Modern Accounting, p. 307.

tates the charging of interest on the capital concerned in order to arrive at the correct result in considering the combining of various enterprises into the proper farm organization. That interest may be used in commercial accounting for similar purposes is stated by Gerstenberg.[1] He states that "In general it is desirable to include interest in cost where materials must be stored for long periods while the seasoning process is being completed and where it is desired to show the effects of variations in the amount of capital employed and in the lengths of the periods during which the capital is employed."

Further use of this common practice in farm cost accounting is found in the adaptability of the figures thus obtained in comparing the efficiency of various parts of the farm business on different farms. Many farmers rent their farms for cash, others for a share of the product, others pay interest on mortgage indebtedness, others own their farms entirely free from debt, while still others pay different forms of rent for various parts of their farms. To compare various factors of efficiency on these farms it is essential to have them on a common basis. This should be considered a secondary reason for the inclusion of the interest in the cost of conducting the business.

In any case, interest on all forms of fixed farm capital[2] should be kept separate, where practicable, and perhaps for the sake of clearness considered a supplementary cost rather than an operating expense, whether the interest is actually paid or not.

One particular point in dispute regarding the charge of interest is the rate that should be used. This assumes a very definite importance when it is considered that many a farm business has a capital value of from fifty to one hundred thousand dollars, the interest on which is often larger than the labor income or the so-called farm profit computed from the year's operations.

The point often has been raised that one is not justified in arbitrarily selecting a rate that it is assumed the capital should earn, thereby dividing that which is commonly referred to as profits into "interest" and "profits." The position is taken in farm cost accounting that this practice is at least as valid as the common practice of assuming arbitrary salaries for personal services rendered in a business. Going rates of interest in communities are well known, and for comparative purposes the fixing of the rate at one-half or even 1 per cent higher or lower than the money possibly might be obtained for does not materially affect the usefulness of the results.

The rate usually used by the Office of Farm Management and Farm Economics in its northern agricultural studies has been 5 per cent upon the entire farm capital and in its southern studies 7 per cent, the difference being due to the regional difference in the interest rates on well-secured mortgages on farm property.

[1] Principles of Business, p. 763.

[2] Interest is not usually applied to working capital as a cost.

In enterprise surveys, such as studies of dairying, beef cattle, and special classes of farm investment, the interest rate is often increased slightly, usually by 1 per cent, as compared with the total farm capital rate, since short-time loans are often made to cover such operations at a rate of about 6 or 7 per cent. This should be charged upon the average capital used in the enterprise during the period of study. On beef cattle it may often run from three to six months, while on dairy cattle it would be for the entire year.

The point is often raised as to whether interest should be charged on feed on hand at the start of the year and purchased during the year that is fed to live stock. One method of handling this charge is to assume that the farm price from month to month should cover the interest, while another method that has been used is to charge interest at the short-time loan rate on one-half the value of the feed which is consumed during the entire period. The same argument might be used for charging interest on the value of seed, the returns from which are not obtained until the crop is harvested.

The practice of the Office of Farm Management and Farm Economics has been usually to ignore this charge on supplies and feeds, on the assumption that, strictly speaking, only two general kinds of farm property should bear an interest charge for any purpose, namely, the fixed assets and the specific current investments, such as cattle and hogs purchased for resale purposes.

Overhead.—One of the most difficult phases of cost accounting to the beginner is the composition and distribution of the overhead expense. There are various uses of the term "overhead." In some instances it may be found to cover a large number of items and to amount to as high as one-third of the costs, or it may embrace only those charges that can not be apportioned directly to the enterprise in hand.

The latter usage is the proper one, namely, to keep the amount charged to overhead as small as possible and to include under this head only those items of expense that are so general as to preclude direct charging to the various accounts. Common among the cash items that go to make up the overhead in a well-conducted system of cost accounting are general farm advertising, stationery, telephone rents, subscription to farm journals, and postage, while the principal labor expense is made up of the labor that is necessary to maintain the farm business in running order but which can not be charged directly to any particular enterprise, such as work on weed control, road maintenance, picking stones, etc. Overhead also includes interest and taxes on the roads and lanes, on the farmstead, and on the headlands of the various fields.

One of the misuses of this item has been to include the shelter costs of live stock, equipment expense of live stock, sire service for

cows, miscellaneous cash expenses of the farm enterprises, and similar items which should all be placed directly against the proper accounts.

Distribution of the overhead expense should be on the basis of the direct expense incurred by the productive enterprises of the farm, namely, the field crops and classes of live stock. The capital investment and productive crop acres and units of live stock have been proposed as bases, but inasmuch as the labor requirements and other costs of the various enterprises vary widely, these methods of apportioning the overhead do not place the proper share of expense against the various enterprises. Inasmuch as all expense is similar in source—that is, is incurred through the use of land, labor, and capital in the operation of farming—the distribution of the overhead expense on the basis of direct expense seems to be a more equitable basis than any other.

Business risk.—There are many classes of business risks, such as loss from hail, drought, fire, diseases, weeds, pests, and employers' liability. It is seldom that a farmer carries a large amount of insurance, and that which is carried is usually not for the full value, so that the farm carries the remainder of the risk. The insurance that is carried for a certain business risk is charged directly to the proper account. If no insurance is carried, it is not common practice to charge the farm with the risk as an expense but rather it is assumed that the profits should be great enough to carry this risk.

Some authorities have advocated the charging to crops and classes of live stock the full insurance charges against these various risks, whether carried or not, on the assumption that the farm business must stand the loss if such is entailed, and that therefore an insurance charge is warranted. However, inasmuch as insurance is a direct cost, it is doubtful if it is good accounting to charge any other than the actual expense incurred for the risk involved. It is nevertheless true that the net returns should be such as to cover uninsured risks of the business.

Profit.—In complete cost-accounting studies there has probably been little misuse of the term "profit," inasmuch as the accounts are in sufficient detail to bring out the actual profit or loss made. In a great many publications, however, the term is misused by applying it to the return from an enterprise or a farm business above one or two of the principal expenses. For example, it has been quite common practice to call the return above feed of dairy cows "profit." In some cases the labor may be included as a cost along with the feed, and the difference between these charges and the receipts called "profit." As a matter of fact the miscellaneous and indirect charges of some farm enterprises amount to one-third of the total cost of operation, and to leave these items out of consideration in determining the cost of the enterprise is erroneous and misleading.

The various uses of the term "profit" illustrate the need for a more general understanding as to the nomenclature used in farm accounting studies. Doubtless the time is coming when "profit" will mean just one thing to everyone interested in the farm business, while "farm income," "labor income," "interest on investment," and other kindred terms will express the precise meaning intended, by virtue of a wider dissemination of the correct definitions and the proper use of these terms.

In common farm-accounting practice the profit from a farm business is that amount which remains after all expenses, including the labor used on the farms, and interest on investment in the farm business, have been deducted from the total receipts, the total receipts to include cash receipts, farm products consumed on the farm, and increase in inventory other than an increase in the value of land owing to an unearned rise in value. If the inventory is properly kept, any permanent improvement added to the farm as an expense will be counterbalanced by a proper increase in the value of the farm, but a more or less arbitrary increase in the value of the land should not be included as a receipt in the operation of the year's business.

In commercial accounting practice, however, interest on investment or capital is not commonly included in the costs. The position is commonly taken that profits can not be divided into "interest" and "profits," but that the total remainder above all operating expenses represents the profit, which may be expressed as a certain percentage of the capital investment. Interest can not arbitrarily be estimated and taken out in computing the costs and arriving at the total profit. In comparing farming as a business with other lines of business, when a total profit or net return is used interest on the farm capital should not be included in the costs in determining the profit.

There is also need for distinguishing between the profit from a particular enterprise on the farm and the profit from the entire farm business. From an accounting standpoint, for example, the field crops, considered as separate enterprises, will often show a very good profit, while the live-stock enterprises which consume these crops may show a very small profit or an actual loss; nevertheless, the returns from the farm business at the end of the year are such as to be satisfactory to the farm operator.

THE ROUTE PLAN.

The route plan of obtaining cost of production data, as conducted at the present time by the Office of Farm Management and Farm Economics, involves studies of a group of from 20 to 25 farms in a locality. A field statistician spends his entire time in the vicinity,

visiting the farms at regular intervals, not less than twice each week, for the purpose of gathering the necessary data for the entire farm business. This means that the man must visit from 6 to 8 farms each day, obtaining a record of the labor in detail for the period that has elapsed since his former visit, supervising the keeping of the cash account, and obtaining data as to yields, production of live stock, feeding practices, household consumption of farm products, etc. From the field blanks the data are usually transcribed by the field men to office forms, which are then forwarded to the local office, at which practically all the records are summarized and from which reports are sent back to the farmers.

Following is a brief description of the primary records collected by the route agent in the field, no attempt being made to illustrate or describe the methods of tabulating and summarizing the complete records of the farm business for the year.

THE LABOR RECORD.

One of the most difficult cost records to keep accurately is the detailed labor record. One of the strong features of the route plan is the frequent personal visit which enables the route man to keep track of the labor expenditures. Often the record of the labor is taken directly from the farmer's verbal report to the field man, but it is becoming more common practice for the farmer to record all the labor performed each day on a convenient blank, which is quickly copied and checked by the field agent.

One of the principal difficulties in connection with the daily labor report is that of accounting for the entire day for all the farm workers. With the multitude of tasks involved in the farm business, it is very easy to overlook certain operations that are really important.

This is one reson why the route plan seems to give better results than some other methods, since the agent is at hand to check at once any discrepancy, or to ask for further information if the daily labor reports are not complete.

The record of the daily chores, or regular daily work, is taken in total each day, but distributed to the classes of stock once or twice a month. It has been found by statistical analysis of a great many records that the chores through a given month will require about the same amount of time each day unless the number of stock changes considerably. It is much easier for the farmer to report the total time of regular daily work each day, and to divide it once or twice a month among the classes of stock that require the chore labor, than it is to attempt to distribute the chore labor each day. For convenience in reporting the chore labor and for the recording of changes in the number of live stock each month, a special form has been prepared, entirely separate from the regular daily labor report. (See fig. 3.)

Figure 1 illustrates the blank labor form used in recording labor in the cost-accounting studies now in progress. It shows how the record is kept by the farmer for himself and his hired help on the same page. Space is provided on the labor sheet for extra day labor employed in harvest or other seasons when extra day labor is needed.

Figure 2 illustrates a form of labor report which is kept by each man working or where each man's report is filled out separately for him by the proprietor. The men usually draw lines to indicate the actual hours spent in various operations, indicating the field number and the number of horses used. The tabulator or the field man can get the number of man hours by figuring the time between the lines drawn across the sheet. It is then a matter of multiplication to get the horse hours.

The advantage of this form is that it accounts for the full day and is kept by each man on the farm. The disadvantage lies in the large amount of tabulating and summarizing necessary in posting the records. This form has been used with very good success in the correspondence plan of obtaining farm data.

Figure 3 illustrates the form used for the average monthly distribution of the daily chore labor, together with the changes in the number of live stock during the month. This form does not always give the operations separately, as "feeding cows," "milking," "cleaning the barn," "separating the milk," etc., but it has been found very satisfactory in distributing the regular daily work time over the various classes of stock. When this report is received by the office tabulator, it is checked with the total amount of labor reported daily for the total chore time.

FEED REPORT.

The feed report is one of the most difficult records to obtain accurately. It is comparatively easy to arrive at the total amount of feed consumed on the farm by all classes of live stock, through recourse to the inventories, the yields, and sales and purchases of the various crops and feeds used on the farm. The difficulty arises in determining the total feed or the feed per head consumed by various classes of stock where they are all fed out of the same mow, the same corn crib, and the same granary. On large farms it is often possible to keep a bulk feed record for different classes of stock, inasmuch as they are often separated in the different barns and fed from different mows, bins, and cribs.

The most satisfactory system of obtaining the feed record where all classes of stock are fed from a common source is that known as the "unit" system, usually based on the amount of each of the different kinds of feed consumed per mature head of stock per day. On the cost-accounting routes an attempt is made to have the farmer

use the measuring unit in his feeding operations. For example, in the feeding of horses a pan or measure is usually kept for the grain fed, or so many ears of corn are fed per meal or per day. Cattle are often fed by the scoop. Silage is usually fed by the basket or cartload. Bundle corn is fed by the bundle. The route agent determines the average weight per measure or per unit of feed, and with this computes the amount consumed per head daily.

For some classes of stock it is frequently possible to have a bulk record of grain and roughage fed, and thus note is simply made of the number of days required to consume the total amount of feed that is set aside. In hog and beef cattle feeding this method is often used to very good advantage.

No attempt is made to determine feed weights daily, but the farmer reports to the route agent in case the number of measuring units is changed, so that the proper computation of the feed consumed for the specific class of live stock may be made by the agent.

An important feature of the work of keeping the feed record is known as "checking" the inventories, crop yields, and sales and purchases against the amount consumed by the live stock. Checking is particularly important in the case of the roughage feeds, for which it is sometimes difficult to get an accurate measuring unit. It is frequently necessary to make adjustments between the feeding record and the yield record, particularly in the case of hay, corn fodder, stover, and like feeds, inasmuch as it is usually impossible to get yields accurately by weight. On some farms it is necessary to keep a monthly adjustment feed sheet, on which the total feed consumed since taking inventory is checked monthly with the inventory and sales and purchases.

The question of the price to be placed on the various kinds of farm feeds is often confusing to the route agent. Farm feeds vary so greatly in quality, and there are so many feeds for which there is not a ready market quotation, that it is frequently difficult to be sure that the proper price has been used. It is sometimes necessary for the route agent to use his judgment as to the relative value of different grades of hay, and of ear corn fed in fodder, based upon market quotations of marketable hay and upon the yield of corn in the corn fodder. It is the usual practice to require the route agent to send to the office a monthly market report of the local prices on all feed and live-stock products so that adjustments may be made later if necessary. Allowance is always made for the cost of hauling, which is either added to or deducted from the market price of feed according to whether the feed is purchased or home grown.

Figure 4 illustrates the form used by the route agents in reporting the feed record to the office. Usually the rough notes of the number

of measures of feed and the weight of the measure is kept in a pocket notebook, and the record from the notebook transcribed to the form illustrated in figure 4. It will be noted that, unless otherwise specified, the figures in the record indicate the amounts consumed per head per day for the various kinds of stock.

FINANCIAL REPORTS.

The cash account is usually one of the easiest records to obtain, inasmuch as in most types of farming there is no large number of cash items to be entered on the books in any one month. This record is often kept by the farmer in a common notebook or ledger book, and is transcribed to a form kept by the route agent, or the farmer may keep the cash account in a book such as that illustrated in figure 5. Usually this account is kept in duplicate, so that the farmer or the route agent simply tears out one sheet, leaving a permanent cash record on the farm. The duties of the route agent in connection with the financial account are to see that it is kept up to date and that all items are included.

The purchases and sales on credit are recorded in the first column on the form illustrated in figure 5, and it is essential for the route agent to watch this column in connection with the cash payments as they are made later on in the year.

SUPPLEMENTARY CROP DATA.

There are certain minor items concerned in the production of crops and maintenance of live stock which are often overlooked in the keeping of the farm record. Such items are, the quantities of seed used in the various fields, the amount of binder twine used, quantities and cost of the spraying materials for the crops, orchard, and garden, the containers used in harvesting certain crops, the amount of manure produced and used on the farm, and the amount of fertilizer applied to various fields.

To facilitate keeping this record up to date, the route agent is furnished with a supplementary data sheet, calling attention to these items so that they may be kept in mind. It is a common practice for the farmer to report the quantities of seed, fertilizer, twine, spray material, and other items consumed for each field, along with the labor record sheet from time to time as these materials are applied, and the record is transcribed from this daily labor sheet to the supplementary crop data sheet by the route agent.

HOUSEHOLD RECORDS.

To obtain the cost of labor to be charged to the various enterprises the board cost becomes an essential part of the labor record. This means that there must be a household account of the cost of feeding the laborers on the farm. To obtain a complete crop and

live-stock account, it is also essential to have recorded the amount of farm produce grown on the farm which is consumed in the home. It is common practice to inventory the kitchen, dining room, and the bedroom equipment used for the laborers, and to allow going wages for the household help in arriving at the cost of board and lodging of the hired laborers.

It is not always a simple matter to determine accurately the amount of produce consumed in the home. To facilitate the keeping of this record the garden is usually charged in toto to the household account, and if any garden produce is sold the return is credited to the household account at the end of the year. This saves the trouble of attempting to record and evaluate various items of vegetables as they are consumed. The dairy, poultry, and other live-stock products are the principal items that must receive attention in this record as they are consumed.

Where married men are kept on the farm in separate tenant houses certain perquisites are usually furnished in the way of the keep of a cow, a share of the chickens, and a garden plot. In an estimate of the cost of hired labor these items must be taken into consideration along with the cash wages paid. It is also common practice on many farms for the married help in the tenant house to board the single hired men who may be employed. The most common practice in this regard is for the owner of the farm to pay the board of the single hired men at an agreed rate per month.

There are two ways of getting the household record. One is to get from the housekeeper a monthly estimate of the amounts of the various products consumed, as illustrated in figure 6. When this form is used the quantities are estimated by the housekeeper and the values placed on each item by the route agent. Another way is illustrated in figure 7. This card is tacked up in the kitchen in a convenient place, and the housekeeper records on it daily the essential farm products consumed. Each of these forms has proved very satisfactory in cost-accounting studies.

PRODUCTION RECORDS.

In most instances the production record applies to the yield of the various crops and to the dairy production. Where the milk is weighed, either daily or weekly, the ordinary commercial forms for dairy records are used on the cost-accounting routes. The yield record of the various crops, by fields, is usually taken down on the farm by the route agent in an ordinary notebook and later transcribed to the supplementary crop-data sheet, which affords opportunity for the rechecking of the yields. Often the yields must be expressed for the time being in terms of the number of loads rather than in weight, particularly in the case of feeds that shrink much in the curing process.

FIELD MAP.

It is essential in all cost-accounting work on the farm to have measured acreages of the various fields on which records are being kept. From the organization standpoint a carefully drawn map of the fields and the farmstead also aids the farmer by emphasizing any change in farmstead and field arrangement that will make for the more economical operation of the farm. This is one of the first steps toward the reorganization of a farm business, as the layout of the farm is one of the important features of its organization. If the map is made on a reasonably large scale it may be found possible to note on it the rotation and the yield of the crop in each field, together with the amount of fertilizer and manure applied, the amount of seed and twine used, and other items of value for each particular field.

THE ROUTE METHOD OF ENTERPRISE STUDY.

For certain types of farm production the route method, when applied to a single enterprise, has proved successful. Studies conducted by this method are usually a combination of the survey and accounting methods, inasmuch as a record of the entire year's business for the farm is obtained at the end of the year by the survey, while the accounting method is applied intensively to the special enterprise studied. Good examples of this combination of the two methods are found in the cooperative tobacco cost study conducted in Kentucky, and in the cooperative studies of the cost of fattening cattle in the corn-belt States.

In the tobacco project each route consisted of 75 farms, a route man taking care of the tobacco project by the accounting method, while a survey was made on each farm at the end of the farm year to cover the other activities of the farm business. These studies are most sucessful on specialized farms where the enterprise studied is the most important item of production. Detailed labor records are kept for the special crop, and the acreage of this particular crop is measured carefully by the route agent. All financial records pertaining to this crop are carefully made, and at the same time an attempt is made to get a complete financial record of the entire farm business through the year. In the case of tobacco it is practically a year's study, inasmuch as the marketing operation on the tobacco crop occupies a long period of time and often a part of the crop is held over after the succeeding crop is planted.

In the case of the beef-cattle studies, a survey of the previous year's business on 75 to 100 farms was made in each locality, and 25 to 30 of these farms were formed into a group to be visited by the route agent throughout the cattle-feeding season. This season usually lasts from five to seven or eight months. During that time the enterprise record covers in detail the feed, labor, and cash require-

ments of the cattle and the hogs following them. When the cattle are marketed, however, the route agent discontinues his routine visits, but returns to each farm at the end of the farm year and makes a survey of the entire farm business.

OCCASIONAL VISIT AND BOOK PLAN.

Under the occasional visit and book method, labor, feeding, financial, and production records are kept by the farmer in a book provided for that purpose, and occasional visits are made to the farm by the supervising agent in charge of the project. These visits may be made once in two months, or as infrequently as once in three months.

The value of this method [1] lies in the large number of farmers who may be carried on the accounting project with a correspondingly low cost per farm. It seems essential with this method to select the farms very carefully, since much depends on the interest and accuracy of the farmers.

CORRESPONDENCE PLAN.

The Office of Farm Management some years ago developed a correspondence plan of cost accounting which was placed in operation on a considerable number of farms in various parts of the United States through approximately a 10-year period.

The advantages of this method were the large number of farms that could be covered with a given fund for study and the wide range of conditions that could be represented. The disadvantages were the lack of personal supervision in the recording of the data, the constantly arising question as to the completeness and accuracy of the records, the difficulty of keeping up the interest of the cooperators, and the danger that the cooperator might lack the ability or inclination to give the accounts through the year. The question of unconscious bias is one that enters into all accounting records, and lack of supervision with the cooperators far above the average in intelligence and ability are factors in the bias problem. There is also a tendency for cooperators to drop out after the first year, for it often becomes a heavy task to keep the labor record up to date. For this reason it is usually impossible to obtain long-time records by this method.

Because of the disadvantages enumerated above, it has been felt that the route plan, combining some of the reporting features of the correspondence method, is preferable, since it provides the supervision and attention to details that are essential to complete farm records.

[1] The system is fully described and explained in the revised Farmers' Bulletin 572, "A System of Farm Cost Accounting."

DISTINCTION BETWEEN "COMPLETE COST ACCOUNTING" AND "FARM RECORDS."

Many persons interested in the farm business are inclined to confuse the keeping of ordinary farm records with detailed cost accounting. Most of the agricultural colleges, in cooperation with the extension agencies of the United States Department of Agriculture, have prepared farm record books for the recording of inventories and cash accounts for individual farms, and recently these have been used extensively in the making up of the income-tax statements required by the Federal Government. Keeping such records is a most important step in the business operation of the farm, but it should not be called "complete cost accounting," nor should it be implied that the farmer will know the cost of producing his separate products by the keeping of such a book.

The farm inventory and cash account will give the farm receipts, the farm expenses, farm income, labor income, the net worth, the interest earned on investment, and other figures that are very important to the farmer. Cost accounting goes considerably further in that it includes the labor record, feed record, production record, and the summarizing of the data at the end of the year so that each productive enterprise bears its share of the overhead or general farm expense. One is relatively simple and the other is so complex that few farmers can afford to give the attention necessary to keeping a set of detailed cost accounts. It is believed, however, that every farmer would find it advisable to keep a simple farm record book.

To illustrate the wide difference in the results obtained by the detailed cost-accounting method as compared with the common farm record book, the following comparison is made:

Results obtained from simple farm records.

1. Total profit or loss.
2. Total receipts, expenses, farm income and labor income.
3. Distribution of receipts and expenses.
4. Total capital.
5. Total net worth.
6. Income-tax statement.
7. Crop acres per man and per horse.
8. Receipts per acre and per animal unit.
9. General distribution of farm area.

Results obtained from detailed cost-accounting studies.

(Other than those given for simple farm records.)

1. Relative profitableness of enterprise.
2. Distribution of capital, income, cost, and profit or loss by enterprises.
3. Relative importance of the elements of cost.
4. Labor requirements of enterprises.
5. Distribution of labor by days, months, and seasons, and by enterprises.
6. Utilization of various sized power units by operation.
7. Comparative cost of operation of various forms of farm power.
8. Utilization and working life of farm implements.
9. Cost of maintaining farm work horses.
10. Quantities of feed consumed per head by seasons by various classes of stock.
11. Productivity of live stock.
12. Length of working day, by individuals, by seasons.
13. Yielding qualities of the soil.
14. What the farm contributes to the family living.
15. Utilization of farm area by measured acreages.
16. Arrangement of fields and farmstead.

THE SURVEY METHOD.

FARM BUSINESS ANALYSIS.[1]

When the survey method was first used in studying the profits of the farm business the studies were commonly called "Farm Management Surveys." To distinguish the general survey from other surveys of parts of the farm business, the term has been changed to "Farm Business Analysis." This is primarily the study of farm profits and of the fundamental principles underlying the organization of the farm from the standpoint of financial return. The Office of Farm Management has made a large number of farm business analysis studies and has recognized three types of this method of analysis. The first is the analysis of a large number of farms typical of a rather well-defined type of farming in a region for one year only. The second type is the continuing analysis, repeated on a number of farms in the same locality each year for two or more successive years. The third type is the repeated periodic analysis in a region usually after the lapse of a 5 or 10 year period.

ENTERPRISE COST STUDIES.

By an enterprise is meant a separate crop or class of live stock. In this type of studies emphasis is laid upon one particular enterprise. The studies are conducted along the lines of the farm business analysis, in that the personal visit method is employed, questions being asked of the farmer, who depends largely upon his experience and knowledge of his farm practice for the answers. Of recent years the keeping of farm records by farmers has greatly increased the accuracy of the personal visit method, both in the study of the farm profits and in the study of the cost of the operations of a particular enterprise.

Enterprise studies are best obtained for special or more or less staple products, such as wheat, cotton, sugar beets, potatoes, milk, and fruit. Since such products constitute an important part of the farm business, knowledge of the requirements for their production is usually uppermost in the farmer's mind.

An important phase of the enterprise work is the practical application of the data to farm organization problems. Along with the enterprise records it is usually desirable to obtain a farm business analysis record of the entire farm, in order to understand the economic place of the enterprise in the scheme of farming. This procedure is especially advisable when it is intended to draw conclusions as to the advisability of continuing or increasing the production of the particular crop or class of live stock under consideration. By

[1] For a complete description of the business analysis method, with a statement of the results obtained by the Office of Farm Management over a term of years, and examples of the application of this method, see Farmers' Bulletin 1139, "A Method of Analyzing the Farm Business."

having definitely in mind the relation that exists between the special enterprise and the farm business as a whole, it is often possible to bring out facts leading to conclusions not indicated by the enterprise alone.

These data are extremely valuable also in the calculation of the overhead charge which each productive enterprise on the farm must carry. For example, in the study of the cost of producing wheat, unless the wheat land is valued high enough per acre to cover the nonproductive acres on the farm, the carrying charge for these nonproductive acres is not included in the cost of the wheat crop. There is also a certain amount of farm labor spent in the maintenance of the farm which it is impossible properly to distribute over the productive enterprises without having a record of the entire farm business, though in localities where the detailed cost-accounting method is followed it may be possible to arrive at a percentage figure which may be used to approximate the overhead charge on farms studied by the survey method.

NORMAL COST FACTORS.

A very important function of the enterprise cost study is to establish normal figures for various operations, yields, and costs for each of the farms visited. By "normal" is meant the average over a number of years. The advantage of this information lies in the opportunity it affords of comparing the results for a particular year with what may be expected in the long run. Such comparisons provide a fundamental background for a more accurate study of the variations that are likely to occur in connection with the enterprises considered.

BASIC ELEMENTS OF COST.

From the data obtained in the enterprise surveys may be determined the basic and stable factors of labor and materials necessary to production in the given enterprise, which constitute a basis for practical estimating of such costs at different rates for labor and materials. Further, the method allows the covering of a large area and the study of a greater number of instances than the detailed cost-accounting method, with a given expenditure of time and money. The enterprise surveys yield data on special crops or live-stock enterprises which it would be difficult or impossible to obtain through the cost-accounting method, as the farms are often so widely scattered that the accounting method would be too costly. To obtain representative evidence of the economic factors of the production of an enterprise, it is advisable to obtain a volume of data that can not be economically supplied by the latter method.

THE ENTERPRISE RECORD IN DETAIL.

The first consideration for the record of any enterprise cost study is the size and value of the entire farm, with the distribution of the acreage and values of the land used for the production of the various crops for the previous year, and a statement of the yields and cash receipts from the various crops.

Man labor.—In the special enterprise to be studied, the principle and most difficult items of direct expense are considered in turn. The first of these is the direct labor on the enterprise. The labor is first considered in terms of the hours of man and animal or mechanical power required by the various operations concerned in the production of the crop or animal product in question. This is expressed in terms of the normal rather than as the extreme time in which the operation may be performed. It is usually approached in such a manner as to arrive at the number of acres covered in a day of 9 or 10 hours with a certain power unit; this factor, applied to the acreage, say of a particular crop, provides the total time required on that crop. This has been termed the practice side of an enterprise study; that is, obtaining the basic information as to what are common practices and the amount of time necessary to perform the operations. Next, it is essential that a record be obtained of the cost of all labor used on the farm, together with an approximate record of the total number of months of man labor expended, the amount of wages paid, and an estimate of the cost of board consumed by the hired help.

Horse labor.—In studying by the survey method an enterprise in which horse labor is an expense, it is always difficult to arrive at a satisfactory rate per hour of horse labor without reference either to detailed cost accounts for similar types of farming or to information obtained by the survey method on this particular point. It is often possible to obtain fairly accurate figures on feed requirements and other costs of maintaining farm work horses along with the enterprise survey, thus providing a means of determining approximately the cost of horse labor per hour.

Materials.—"Materials" include the seed, twine, spray material, feeds, etc., used in production. With figures on the quantities of materials actually used are recorded also current prices, but the quantities are noted on a normal basis as well as for the current year. It is advisable to record, in this connection, the approximate total expense of operating the farm, in order to be able to compare the enterprise studied with the total earnings, expenses, and the labor income of the farm as a whole.

Equipment.—The next item of importance is farm equipment, with special emphasis on the equipment used for the enterprise studied. Usually it is advisable to obtain a very complete list of the larger

machines, with the farmer's estimate of the approximate length of time they will last, and the amount spent for repairs during the year.

Buildings.—Figures are obtained on the present value of the farm buildings, usually divided as farm dwelling, tenant houses, and other farm buildings. This information is of value in arriving at the overhead charge which is to be carried by the productive enterprises of the farm.

SUMMARY OF ENTERPRISE DATA.

The following summary gives the items and principal elements of cost which should be obtained in an enterprise study for the particular enterprise in mind and also for the entire farm business:

For the enterprise.

1. Normal yield and acres of crops or normal number of live stock by years for a three to five year period.
2. Direct labor requirements.
3. Feed and material quantities and expense.
4. Proportion of total labor chargeable to enterprise.
5. Proportion of equipment expense chargeable to enterprise.
6. Proportion of overhead.
7. Special marketing notes.
8. Special enterprise notes.

For the entire farm.

1. Area, value, and distribution of farm area.
2. Live-stock inventories.
3. Inventory of equipment.
4. Inventory of buildings.
5. Cash receipts from all sources.
6. Cash expenses.
7. Inventory of feeds and supplies.
8. Total amount of all labor, with rate of wages for hired labor.
9. Estimated expense of maintaining work stock.
10. Total amount of horse labor.

Data as above outlined will permit the working out of the basic requirements for producing enterprises and will provide a basis for the distribution of fixed charges, including overhead expense. With the data from the entire farm business, the relation of the enterprise to the farm is shown by its proportionate use of land, labor, and equipment, and by its costs and earnings, as compared with those for the whole farm. It is also possible to compute from these data labor income and interest on the farm investment, which are of value in considering the status of the enterprise studied. This is especially true if the product in question is by far the most important, such as cotton on cotton farms and wheat on wheat farms.

ENTERPRISE STUDIES WITHOUT COMPLETE BUSINESS ANALYSIS.

A number of separate studies of farm enterprises have been made by the Office of Farm Management and Farm Economics without attempting to obtain a complete business analysis of the farm. Similar studies have also been made by various State institutions, but usually the enterprise in question has been of an outstanding, special type, and of considerable commercial importance. Among these studies may be mentioned those of the cost of producing sugar beets, apples, potatoes, beans, sweet corn, cabbage, onions, and tomatoes. This manner of studying the enterprise does not permit taking into consideration the relation of the enterprise to the entire

farm business, which is often of great importance from a farm organization standpoint. From a strictly accounting standpoint, the lack of complete farm data increases the difficulty of accurately apportioning the overhead expense to the enterprise. There is also danger of drawing erroneous conclusions as to the relative importance of the enterprise, but this disadvantage has generally been minimized by the selection of enterprises that bring by far the greater part of the cash return of the farm business.

Experience has shown that it is usually best to include the farm business analysis data with the enterprise studies, when this can be done without putting too great a burden on the farmer. Extremely long schedules are tiring, and there is a consequent lagging of interest, often resulting in inaccurate estimates of important details.

SURVEYS BY QUESTIONNAIRE.

Certain kinds of cost data and farm organization material can be obtained quite satisfactorily by the questionnaire method. The enterprise to be considered by this method must be one in which simple, easily estimated direct costs are to be obtained and one in which considerable data are available by other methods of investigation in order to provide figures on the miscellaneous items of cost that can rarely be accurately obtained through the questionnaire. Where it is essential to study widespread trends of simple farm practices the questionnaire affords a means of obtaining a large number of estimates at a comparatively low expense.

One of the characteristics of the results obtained by using the questionnaire method is that they are usually expressed in averages. This is because the information is usually more general in character than the results obtained by specific studies and a very large number of individual cases are examined to make up the average. For some purposes the average is not applicable, while for others it serves an important function, particularly in indicating trends in various practices.

A decided advantage of this method is that a small investigational force can make an extended study and at a very small cost, the principal expense being for the clerical force necessary to tabulate the large number of returns obtained. A further advantage lies in using this method to obtain a relatively quick estimate of the changes in the price levels of certain cost factors which may be used with the basic elements of cost obtained by other methods in bringing cost data up to date. For example, where the basic factors of producing cotton have been worked out, it becomes relatively a simple matter to estimate the average cost for any given year if the current rates for labor, fertilizer, ginning, seed, etc., are known. This information may often be obtained very satisfactorily by the use of the question-

naire. In general, however, results obtained by this method should be considered with its limitations in mind, for usually a relative figure is obtained, which is indicative rather than specific.

The Office of Farm Management and Farm Economics has made a number of studies by the questionnaire method, principally with reference to the experiences of farmers with tractors and other mechanical farm equipment. By way of experiment, the Office, during 1919, sent a questionnaire on the cost of producing wheat into the same areas covered by the survey method. The usable returns constituted approximately 20 per cent of the total number sent, which was considered merely a fair return for the rather simple questionnaire used. This method was also employed in the fall of 1919 to institute a farm motor truck survey, in which study approximately 60,000 questionnaires were mailed to farm motor truck users, with a usable return of approximately 12 per cent. Considering the length of the questionnaire and the number sent out, this return is considered well worth the expense used in obtaining the information. Figure 8 illustrates the questionnaire used for the wheat crop. Following is the questionnaire used in the motor truck study:

OFFICE OF FARM MANAGEMENT,

UNITED STATES DEPARTMENT OF AGRICULTURE,

Washington, D. C., January, 1920.

Name ..... P. O. address.....

What make is your motor truck? ..... What is its rated size? ..... (Tons.) Did you buy it new or second-hand? ..... How long have you owned it? ..... (Months.) What did it cost, including freight? $..... What did you pay for extra equipment not included in price of truck? $..... Do you own a trailer for use with it? ..... Please give the *important* road hauling with your truck both *from* and *to* your farm, showing total amount hauled, average weight of load, length of haul, and time required for one round trip, *this to include time for loading and unloading.* Show how same hauling was done *before* buying truck.

Road hauling done with my truck during past year.					How same hauling was done with wagon before purchase of truck.			
Material hauled.	Total amount per year.	Weight of load.	Miles one way.	Hours, one round trip.	Weight of load.	Miles one way.	Hours, one round trip.	Horses per wagon.
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....

What part of the time do you have return loads, i. e., loads both ways with truck? ..... Please give below the *principal* road hauling you still do with horses.

ROAD HAULING DONE WITH HORSES DURING PAST YEAR.

Material hauled.	Total amount per year.	Weight of load.	Miles one way.	Reasons for using horses instead of truck for this hauling.
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

Give below *principal* hauling on your farm (not hauling *from* or *to* the farm) with truck.

PRINCIPAL HAULING ON MY FARM (IN THE FIELDS) DONE WITH TRUCK DURING PAST YEAR.

Material hauled.	Total amount per year.	Weight of load.	Average length of haul.	Reasons for using *truck instead* of horses for this hauling.
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

On what kind of roads do you usually run your truck? .....
(Dirt, Tarvia, macadam, etc.)
How long during the past year were the roads in such condition (because of mud, snow, etc.) that you could not use your truck? ..... (Weeks.) What is its average speed on the road when loaded? ..... (Miles per hour.) When empty? ..... (Miles per hour.) On about how many days per year do you use it? ..... How many miles does it run per year? ..... How many miles per gallon of gasoline do you get? ..... How many miles per quart of cylinder oil? ..... What do you pay for gasoline? ..... (Per gallon.)
What for cylinder oil? ..... (Per gallon.) What kind of tires do you use on front wheels? ..... (Solid or pneumatic.) What kind on rear wheels? ..... (Solid or pneumatic, single or dual.)
What do you pay for solid tires? ..... How many miles will they run? ..... What do you pay for pneumatic casings? ..... How many miles will they run?.....
How many new tires have you bought since buying your truck? ..... What kind are best for your conditions? ..... (Solid or pneumatic.) To date how much have you paid for repairs on truck, *not including new tires?* $..... What is the license fee per year for your truck? $..... What per cent of the time do you lose when using it because of motor and tire trouble, breakage, etc.? ..... How many days during the past year was it out of commission when needed? ..... How many more years will your truck give satisfactory service? ..... Please give principal custom work (hauling for hire) with your truck during the past year.

PRINCIPAL CUSTOM WORK DURING PAST YEAR.

Material hauled.	Total amount per year.	Weight of load.	Miles one way.	Price per trip; ton, mile, etc.
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....
.....	.....	.....	.....	.....

What was *total* amount received for *all* custom work done in past year? $..... Was the custom work you did profitable for you? ..... How many acres in your farm (owned and rented)? ..... How many acres are never to crops? ..... Please give main crops grown and kinds of live stock kept last year.

Crop.	Number of acres.	Kind of live stock.	Number of head.
.....	.....	.....	.....
.....	.....	.....	.....
.....	.....	.....	.....

How many head of work stock (horses, brood mares, and mules) do you now keep on your farm? ..... How many head of work stock have you disposed of since buying truck? ..... Has the truck reduced your expense for hired help, either man and horse? ..... If so, how much per year? $..... Who usually drives (Yes or no.)
the truck? ..... What was your principal market before its (Self, son, hired man, etc.)
purchase? ..... How far from your farm? ..... Where is the material (Name of town.) (Miles.)
marketed by truck usually taken now? ..... How far from your farm? (Name of town.)
..... If you changed to a new market when using your truck, please give reasons (Miles.)
for change. Has your truck been a profitable investment? ..... What is (Yes or no.)
best size for your farm?..... What part of your truck has given you the most (Tons.)
trouble?..... What is the principal advantage of a truck for farm use?.....
What is the principal disadvantage?..... Do you own a tractor?..... Do you own an automobile? .....

Please give below names and addresses of other farmers you know who purchased motor trucks for farm use (if more space is needed, use other side of page):

Name.	*Address.*
.....	.....
.....	.....

THE COMBINATION OF THE ACCOUNTING AND SURVEY METHODS OF STUDY.

There are many instances where the combination of the two methods of study has been used to advantage in supplementing the data from either a cost survey or a farm business analysis investigation.

It has been found distinctly worth while when an enterprise cost study is being made to have recourse to records obtained from the detailed accounting method in order to adjust more accurately the charges for overhead expense, machinery, risk, hours of labor, and other elements of cost.

In the cooperative cost of beef-production studies in the corn-belt States routes have been established containing approximately 25 farms each, employing the detail accounting method in arriving at the cost of producing beef on these farms. At the end of the year the survey method is used in studying the business and the cost of production of cattle on approximately 75 other farms in the same community. The data from the detailed accounting method have assisted in more accurately and satisfactorily interpreting some of the results from the surveys.

ADDITIONAL COPIES
OF THIS PUBLICATION MAY BE PROCURED FROM
THE SUPERINTENDENT OF DOCUMENTS
GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.
AT
5 CENTS PER COPY

▽